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Installation Instructions

394
Series G
Size 50 thru 220

GAS-FIRED FORCED AIR FURNACE

bryant

Cancels 39394D66 | 39394D73
3/30/72

INTRODUCTION

Before installing the furnace, refer to Bryant Form No. 39003D1 "Procedure for Gas Appliances" (packaged with the equipment) for information concerning combustion, venting, piping, and other standard installation practices. Further reference is made to the current edition of the American National Standard "Installation of Gas Appliances and Gas Piping," Z21.30.

Model 394 Gas Furnaces are shipped from the factory completely assembled and wired ready for indoor heating installation. They are manufactured with two types of blowers: belt and direct drive. The three smaller sizes (Series G), 50, 80, and 100, are direct drive only. All sizes incorporate a low-voltage terminal strip for convenience of field wiring (except HL and HH Models).

The optional equipment available includes: Counterflow Box; Side and Rear Drop Ducts; Side Filter Racks; Cooling Coil Housing; Combustible Floor Base Packages, for Counterflow Applications; Cooling Relay Kit, for field conversion.

CAUTION:

1. Counterflow furnace must be installed on an approved non-combustible base.
2. Be sure temperature rise does not exceed that specified on the unit rating plate.
3. Be sure to check all controls for proper operation upon completion of installation.
4. Duralast filter on 125 and 137 upflow furnaces must be used with a side filter rack or rear drop duct.

I. CLEARANCE REQUIREMENTS

The upflow furnace design is certified for use on combustible floors.

The Model 394 design is certified by the American Gas Association, Inc., for installation in a closet or alcove provided the following clearances are maintained.

Sides	0" (1")*
Back	0" (1")*
Top of Plenum	3" (0")*
Vent Connector	6" (6")*
Front	6" (6")*

*Figures shown in parentheses are approved clearances when the furnace is installed as a counterflow furnace.

II. CONTROLS

Bryant Automatic Gas Control Valve

Note: On units equipped with an A-643 Bryant automatic gas control valve, there are three positions for the manual valve knob (OFF-PILOT-ON). There is a position stop at the PILOT position. To move the manual valve knob from the PILOT position to either ON or OFF position, the manual valve knob must be depressed.

If not already checked when lighting the main burner, check the proper operation of this valve by moving the room thermostat pointer above and below room temperature and observing that the main burners light on call for heat and go off when the pointer is moved below the room temperature setting. All Bryant automatic gas control valves have a delay when opening or closing.

Automatic Pilot

To check the pilot operation, follow the instructions below:

Attach a low-voltage test light to electrical leads of gas valve. With thermostat set above room temperature, shut off gas supply to burners and pilot, with main manual shutoff valve. If test light goes out within 45 seconds, pilot is functioning properly. If light does not go out within 60 seconds, replace pilot.

Pilots with Thermocouple Elements

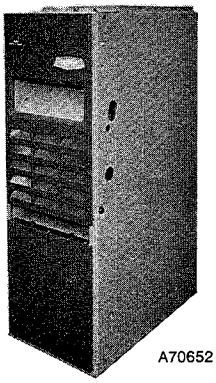
The D2 100% shutoff propane and D5 100% shutoff natural gas controls have pilots equipped with thermocouple elements.

The pilot flame should surround the tip of the thermocouple. It should also extend downward to include 3/8 to 1/2 inch of the thermocouple tip. The flame must not come in contact with any other part of the thermocouple.

D2 Propane

The thermocouple transforms heat energy from the pilot flame into electrical energy. The current thus generated is sufficient to operate the 100% inline shut-off valve. The Bryant automatic gas control valve is powered externally from the transformer, and operates independently of the inline shut-off valve. When there

UPFLOW FURNACE



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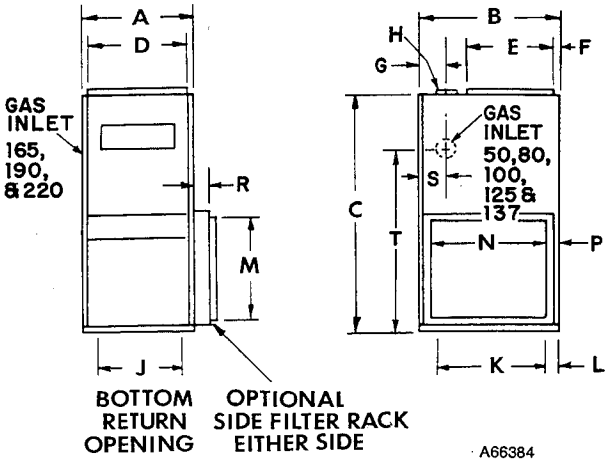

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Model No.	A.G.A. RATINGS BTU/HR				Gas Connection Sizes		Bottom Filter Sizes	Side Filter Sizes	Approx. Shipping Weight
	Natural		Propane						
	Input	Bonnet Capacity	Input	Bonnet Capacity	Natural	Propane			
50-394	50,000	40,000	50,000	40,000	1/2	1/2	14 x 25 x 1	14 x 25 x 1	135
80-394	80,000	64,000	75,000	60,000	1/2	1/2	14 x 25 x 1	14 x 25 x 1	153
100-394	100,000	80,000	100,000	80,000	1/2	1/2	16 x 25 x 1	16 x 25 x 1	178
125-394	125,000	100,000	125,000	100,000	1/2	1/2	20 x 25 x 1	20 x 25 x 1	200
137-394	137,500	110,000	Not Available		1/2	1/2	20 x 25 x 1	20 x 25 x 1	202
165-394	165,000	132,000	150,000	120,000	1/2	1/2	(2) 14 x 25 x 1	(2) 16 x 25 x 1	282
190-394	190,000	152,000	175,000	140,000	1/2	1/2	(1) 16 x 25 x 1 (1) 20 x 25 x 1	(2) 16 x 25 x 1	365
220-394	220,000	176,000	200,000	160,000	1/2	1/2	(1) 16 x 25 x 1 (1) 20 x 25 x 1	(2) 16 x 25 x 1	365

Model No.	A	B	C	D	E	F	G	H	J	K	L	M	N	P	R	S*	T*
50-394	16-1/4	26	46	14-5/8	19-3/4	1/2	2-9/16	4"	12-1/4	22-5/8	1-1/2	12	23	1-1/4	2-1/8	2-7/8	25-7/16
80-394	16-1/4	26	46	14-5/8	19-3/4	1/2	2-9/16	4"	12-1/4	22-5/8	1-1/2	12	23	1-1/4	2-1/8	2-7/8	25-7/16
100-394	18-1/4	26	46	16-5/8	19-3/4	1/2	2-3/4	5"	14-1/4	22-5/8	1-1/2	14	23	1-1/4	2-1/8	2-7/8	25-7/16
125-394	20-1/4	26	46	18-5/8	19-3/4	1/2	2-3/4	5"	18-1/4	22-5/8	1-1/2	18	23	1-1/4	2-1/8	2-7/8	25-7/16
137-394	20-1/4	26	46	18-5/8	19-3/4	1/2	2-3/4	5"	18-1/4	22-5/8	1-1/2	18	23	1-1/4	2-1/8	2-7/8	25-7/16
165-394	28-1/4	28-13/16	51	26-5/8	17-3/4	2-1/2	5	6"	25-1/4	23-5/16	2-5/8	23	24	2-1/8	8-5/8	4-1/16	30-5/8
190-394	36-1/4	28-13/16	51	34-5/8	17-3/4	2-1/2	5	(2) 5"	33-1/4	23-5/16	2-5/8	23	24	2-1/8	8-5/8	4-1/16	30-5/8
220-394	36-1/4	28-13/16	51	34-5/8	17-3/4	2-1/2	5	(2) 5"	33-1/4	23-5/16	2-5/8	23	24	2-1/8	8-5/8	4-1/16	30-5/8

*Optional gas inlet right and left sides provided. T = 33-5/8 and S = 3-1/2 on 50 thru 137 sizes only.

is a pilot flame, the current generated by the thermocouple holds the 100% inline shut-off valve in the open position and the gas control valve controls the flow of gas. Should the pilot go out, no current will be generated by the thermocouple and the 100% inline shut-off valve will close. No gas can then flow to the pilot.

D5 Natural

Should the pilot go out, no current will be generated by the thermocouple and the pilot-relay will close, shutting off the gas to the pilot, and breaking the electrical circuit to the Bryant automatic gas control valve.

821/822 Adjustable Fan Control

The Model 394 Furnace incorporates the 821/822 relay for fan control. (The 821 relay is used with the 643 gas valve on furnace sizes 50 through 165 natural gas; the 822 relay is used with the 641 valve on sizes 190 and 220 and all propane units.) The 821/822 has a field-adjustable differential. The "max. off" setting on the dial is for the longest "off" time and shortest "on" time.

When facing the front of the furnace, the "off" cycle is lengthened by moving the adjustment lever to the left. The "off" cycle is shortened by moving the lever to the right. The adjustment of the "off" cycle has the opposite effect on the "on" cycle; however, to a lesser degree.

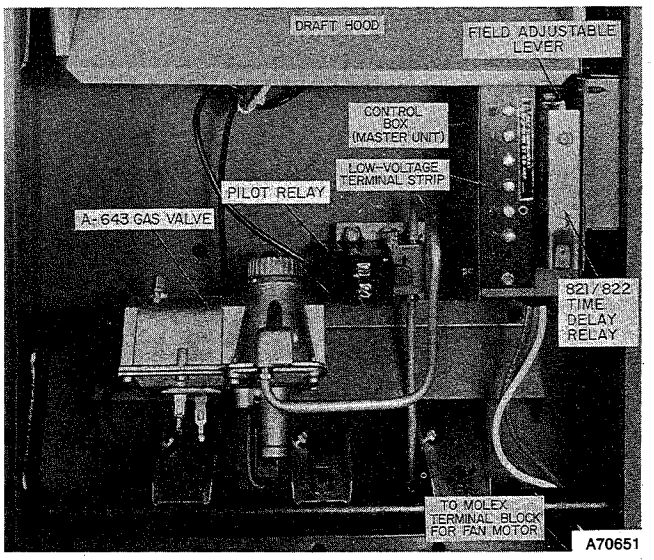
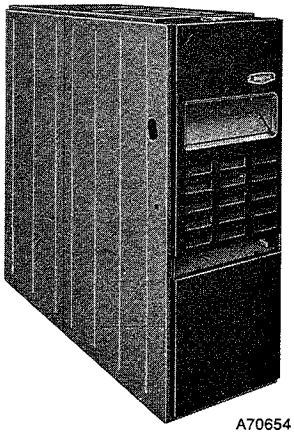


Figure 1 - Control Section (D5 pilot relay shown)

BASEMENT FURNACE



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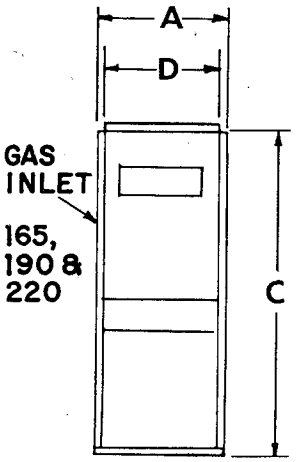

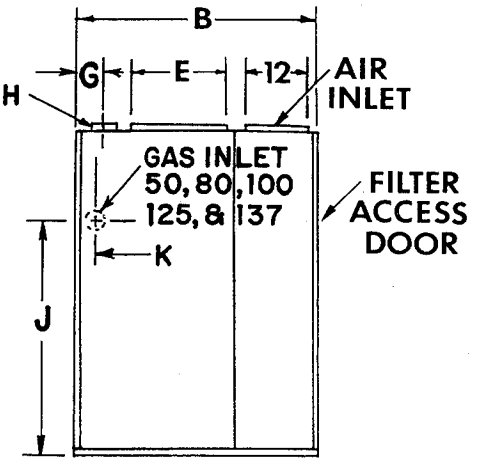

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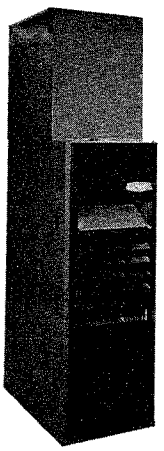
Model No.	A.G.A. RATINGS BTU/HR Natural Input	Natural Bonnet Capacity	Propane Input	Propane Bonnet Capacity	A	B	C	D	E	F	G	H	J*	K*	GAS CON SIZES Nat.	GAS CON SIZES Prop.	Filters	Approx. Shipping Weight (Lb.)
50-394	50,000	40,000	50,000	40,000	16-1/4	40-9/16	46	14-5/8	19-3/4	2-1/2	2-9/16	4"	25-7/16	2-7/8	1/2	1/2	14 x 25 x 1	166
80-394	80,000	64,000	75,000	60,000	16-1/4	40-9/16	46	14-5/8	19-3/4	2-1/2	2-9/16	4"	25-7/16	2-7/8	1/2	1/2	14 x 25 x 1	192
100-394	100,000	80,000	100,000	80,000	18-1/4	40-9/16	46	16-5/8	19-3/4	2-1/2	2-3/4	5"	25-7/16	2-7/8	1/2	1/2	16 x 25 x 1	213
125-394	125,000	100,000	125,000	100,000	20-1/4	40-9/16	46	18-5/8	19-3/4	2-1/2	2-3/4	5"	25-7/16	2-7/8	1/2	1/2	20 x 25 x 1	238
137-394	137,500	110,000	Not available		20-1/4	40-9/16	46	18-5/8	19-3/4	2-1/2	2-3/4	5"	25-7/16	2-7/8	1/2	1/2	20 x 25 x 1	240
165-394	165,000	132,000	150,000	120,000	28-1/4	43-3/8	51	26-5/8	17-3/4	4-1/2	4-1/2	6"	30-5/8	4-1/16	1/2	1/2	Two 16 x 25 x 1	343
190-394	190,000	152,000	175,000	140,000	36-1/4	43-3/8	51	34-5/8	17-3/4	4-1/2	5-1/8	2-5"	30-5/8	4-1/16	1/2	1/2	Two 16 x 25 x 1	428
220-394	220,000	176,000	200,000	160,000	36-1/4	43-3/8	51	34-5/8	17-3/4	4-1/2	5-1/8	2-5"	30-5/8	4-1/16	1/2	1/2	Two 16 x 25 x 1	428

Ratings are certified for altitudes to 2,000 feet for all gases. Ratings for altitudes over 2,000 feet are 4% less for each 1,000 feet above sea level. Return air compartment shipped separately, knocked down.

*Optional gas inlet right and left sides provided. J = 33-5/8 and K = 3-1/2 on 50 thru 137 sizes only.

COUNTERFLOW FURNACE



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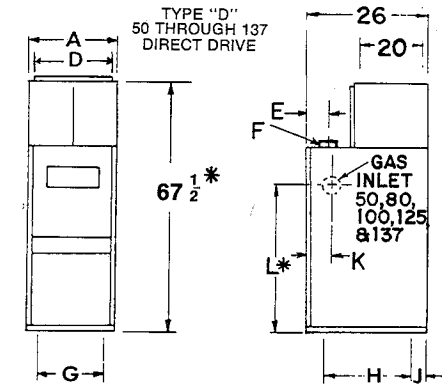

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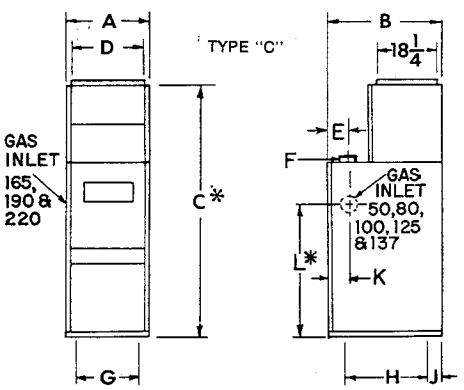

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Model No.	A.G.A. Ratings BTU/HR Natural Input	Natural Bonnet Capacity	Propane Input	Propane Bonnet Capacity	A	B	C	D	E	F	G	H	J	K†	* L†	Gas Con Sizes Nat.	Gas Con Sizes Prop.	Filters	Approx. Shipping Weight (Lb.)
50-394	50,000	40,000	50,000	40,000	16-1/4	26	—	14-3/4	2-3/4	4"	12-5/8	22-5/8	1-1/2	2-7/8	25-7/16	1/2	1/2	16 x 20 x 1	166
80-394	80,000	64,000	75,000	60,000	16-1/4	26	—	14-3/4	2-3/4	4"	12-5/8	22-5/8	1-1/2	2-7/8	25-7/16	1/2	1/2	16 x 20 x 1	185
100-394	100,000	80,000	100,000	80,000	18-1/4	26	—	16-3/4	2-3/4	5"	14-5/8	22-5/8	1-1/2	2-7/8	25-7/16	1/2	1/2	Two 10 x 20 x 1	210
125-394	125,000	100,000	125,000	100,000	20-1/4	26	75	18-3/4	2-3/4	5"	18-5/8	22-5/8	1-1/2	2-7/8	25-7/16	1/2	1/2	Two 14 x 20 x 1	235
137-394	137,500	110,000	Not available		20-1/4	26	75	18-3/4	2-3/4	5"	18-5/8	22-5/8	1-1/2	2-7/8	25-7/16	1/2	1/2	Two 14 x 20 x 1	237
165-394	165,000	132,000	150,000	120,000	28-1/4	28-13/16	80	26-1/4	4-1/2	6"	25-5/8	23-5/16	1-7/8	4-1/16	30-5/8	1/2	1/2	Two 16 x 20 x 1	325
190-394	190,000	152,000	175,000	140,000	36-1/4	28-13/16	80	34-1/4	5	(2) 5"	33-5/8	23-5/16	1-7/8	4-1/16	30-5/8	1/2	1/2	Two 20 x 20 x 1	405
220-394	220,000	176,000	200,000	160,000	36-1/4	28-13/16	80	34-3/4	5	(2) 5"	33-5/8	23-5/16	1-7/8	4-1/16	30-5/8	1/2	1/2	Two 20 x 20 x 1	405

*Add 1-1/4" when installed with base on combustible floor.

†Optional gas inlet right and left sides provided. L = 33-5/8 and K = 3-1/2 on 50 thru 137 sizes only.

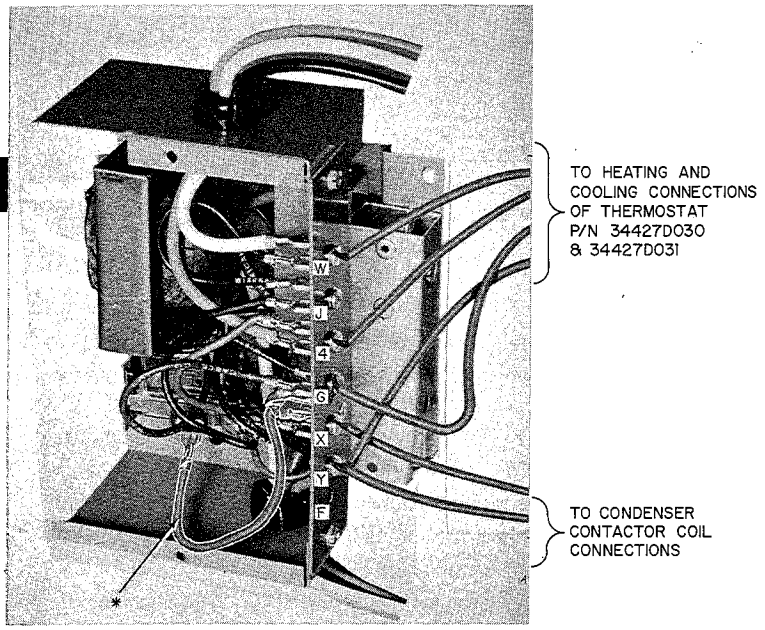
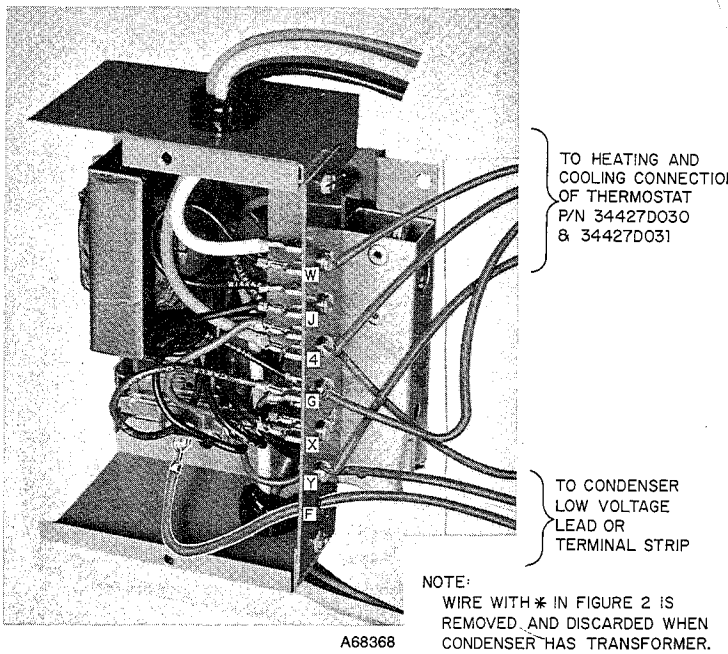


Figure 2 - Control Box, Cover Removed, No Internal Wiring Changes



Figures 3 - Control Box, Cover Removed, Showing Internal Wiring Changes

Low-Voltage Wiring

Field low-voltage connections are made at the low-voltage terminal strip. See Figure 6 for heating only. For Model 394 Furnaces used in conjunction with electric or gas air conditioning units that do not have an integral transformer, see Figure 2. If the 394 Furnace is used in conjunction with an electric or gas air conditioning unit having an integral transformer, see Figure 3.

Figure 3 shows a field-installed wire running from one side of the air conditioning transformer, through the hole marked "F" in the terminal strip to the blower relay in the control box for the Model 394 Furnace. The wire marked * in Figure 2 is removed from the control box and discarded.

Limit Control

This control shuts off the gas and energizes the blower motor if the furnace becomes overheated.

The recommended method of checking the limit control is to gradually block off the return air after the furnace has been operating for a period of at least five minutes. As soon as the limit has proven safe, the return air opening would be unblocked to permit normal air circulation. By using this method to check the limit control, it can be established that the limit is functioning properly and will "fail-safe" if there is a motor failure.

Thermostat Location

The room thermostat should be located where it will be in the natural circulating path of room air. Avoid locations where the thermostat would be exposed to cold air infiltration, drafts from windows, doors, or other openings leading to the outside, or exposure to air currents from warm or cold air registers; or to exposure where the natural circulation of the air is cut off—such as behind doors, above or below mantels, shelves, etc.

The thermostat should not be exposed to heat from nearby radiators, fireplaces, radios, televisions, lamps, or rays from the sun. Nor should the thermostat be mounted on a wall containing pipes or warm air ducts, or a flue or vent which could affect its operation and prevent it from properly controlling the room temperature. Any hole in the plaster or panel through which the wires pass from the thermostat should be adequately sealed with suitable material to prevent drafts from affecting the thermostat.

The heat anticipator on the thermostat should be set at 0.8 amps.

III. ELECTRICAL CONNECTIONS

Line-Voltage Wiring

All electrical connections are to be made in accordance with the local electrical codes. A permanent, live, separately fused electric power supply, complete with manual switch, should be provided for the furnace. Field wiring connections should be made in accordance with the unit wiring diagrams.

Adjustment of Blower Speed

Four-Speed Direct Drive

To change motor speed taps, remove the motor tap lead (see Figure 1) and relocate it on the desired terminal on the plug-in terminal block/speed selector located on the dividing panel. See Table I.

Belt Drive

The blower speed may be changed by opening or closing the motor pulley. When adjusting blower speed, be certain that the pulleys are properly aligned.

TABLE 1 - Factory Setting Blower Motor Chart

Unit Size	Drive Type								
	L		M		E		B	C	CX
	Red to	Blue to*	Red to	Blue to	Red to	Blue to	Red to	Red to	Red to
50	4		4	1					
80	3		3	1	4	1			
100	2	1	3	1	4	1			
125	3	1	3	1	3	1	1	1	1
137	2	1	2	1	2	1	1	1	1
165					2	1		1	1
190							1	1	1
220							1		1

*Use when factory Relay Kit is field installed.

Color Code for Speed Taps

Common (white) . . . . . #C Tap
Hi Speed (black) . . . . . #1 Tap
Med Speed (blue) . . . . . #2 Tap
Med-Lo Speed (yellow) . . . . . # 3 Tap
Lo Speed (red) . . . . . #4 Tap

CAUTION: When adjusting the blower speed, make certain that the temperature rise across the heat exchanger does not exceed that specified on the rating plate.

DRIVE TYPES

B – Belt drive heating – minimum cooling
C – Belt drive heating and cooling
X – Belt drive heating – maximum cooling
L – Multi-speed direct drive heating – minimum cooling
E – Multi-speed direct drive heating – maximum cooling with evaporator blower motor relay.
M – Mutli-speed direct drive heating – minimum cooling with evaporator blower motor relay.

IV. CARE AND MAINTENANCE

Cleaning

The heat exchanger should be examined periodically to see if there has been an accumulation of rust, soot, etc. Clean as follows:

1. Disconnect pilot tubing.
2. Disconnect electrical lead from pilot. (In case of 100% shut-off controls, disconnect pilot thermocouple lead from pilot relay or inline shut-off valve.)
3. Remove front plate from draft diverter (4 sheet-metal screws).
4. Remove burners and pilot as follows:
   a. Remove Tinnerman clamp from burner-holding stud.
   b. Slide burner off orifice and remove under manifold.
   c. Pilot is attached to one burner and is removed with that burner. It is not necessary to detach pilot before removing burner.
5. Remove metal angle strip holding flue baffles in place. See Figure 4.
6. Remove flue baffles. See Figure 5.
7. Use flexible-handled steel cleaning brush to loosen scale and soot. Remove scrapings from bottom of combustion chamber.
8. Reassemble furnace by reversing above procedure.

NOTE: There is a slot in the back of the heat exchanger for the back tip of the burner to fit into. When properly placed, the burner will fit into this slot and will be level.

Care of Blowers

All motors on the belt drive blowers are provided with oil cups and should be oiled at least twice a year with a nondetergent SAE 30 oil.

Belt Tension

Adjust tension on a V-belt so that the belt deflects approximately 3/4 to 1 inch when the pressure from one finger is applied midway between the blower and motor pulleys. Adjust the tension by turning the motor adjusting screw.

Filters

Some units are equipped with a permanent fiber filter (recognizable by its distinct green color). To clean this filter, run water through the fibers from the leaving air side. *Do not* spray this filter with water-soluble oil.

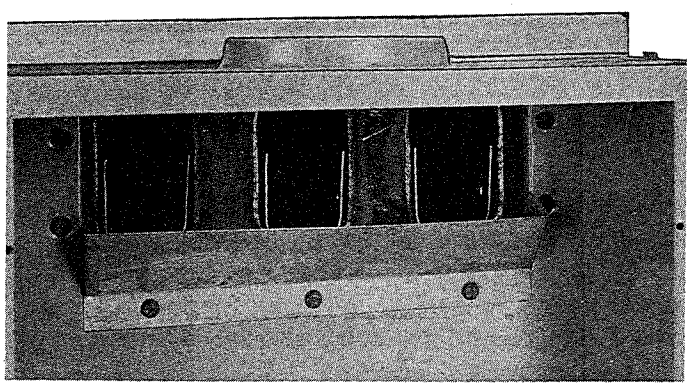


Figure 4 - Flue-Baffle Retainer Strip A66475

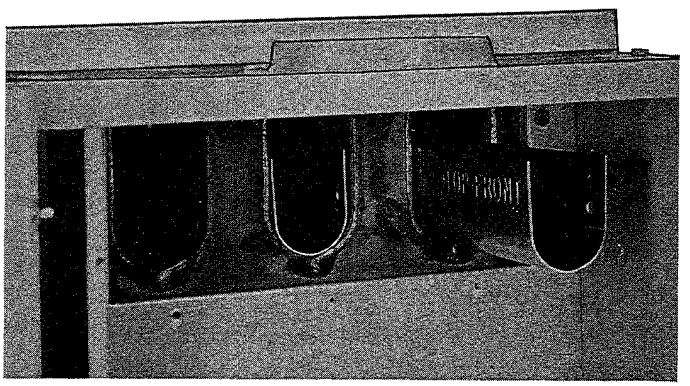


Figure 5 - Removing Baffles A66476

LINE-TO-LINE WIRING DIAGRAMS

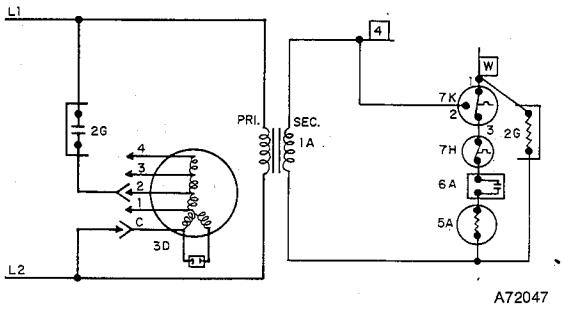


Figure 6 - Units without Heat-Cool Relay (HL Drive)

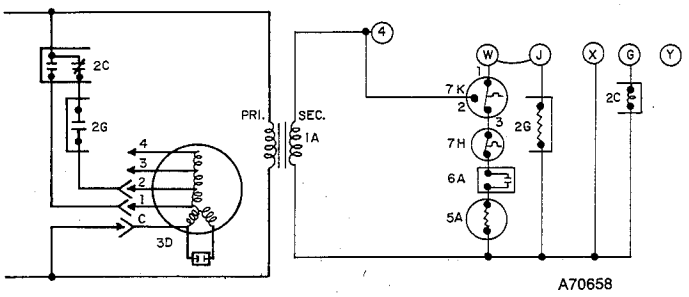


Figure 7 - Units with Heat-Cool Relay (M & E Drives)

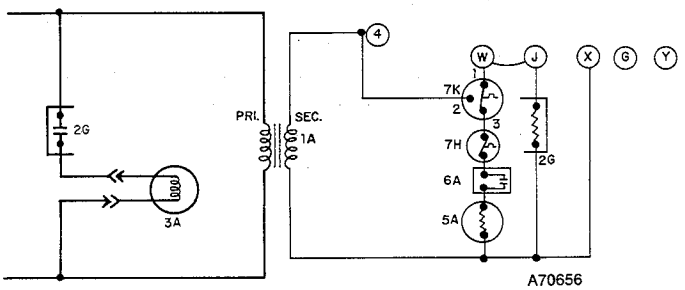


Figure 8 - Units without Cooling Relay (B Drive)

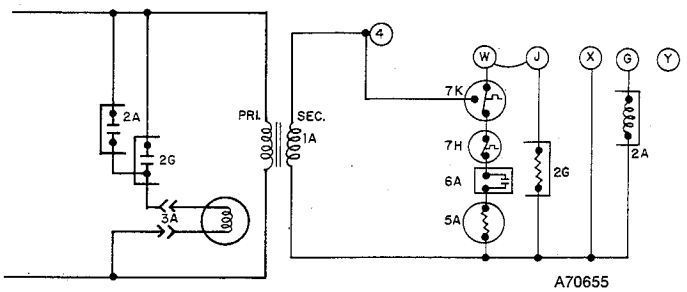
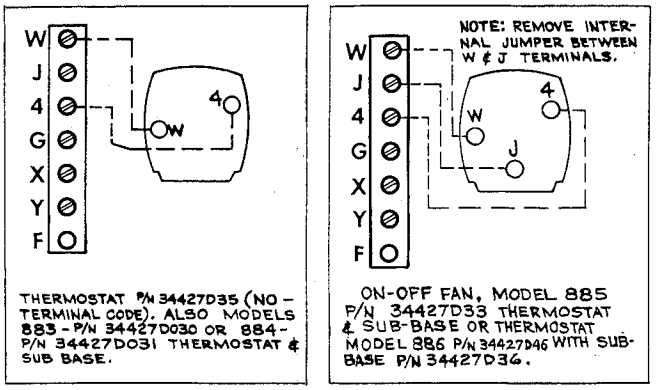


Figure 9 - Units with Cooling Relay (C & X Drives)

1A—Transformer
2A—Cooling Relay-SPST
2C—Heat-Cool Relay-SPDT
2G—Heating Relay-SPST (Heat Motor Operated)
3A—Blower Motor
3D—Blower Motor
5A—Automatic Gas Valve
6A—Pilot Switch (None on Propane)
7H—Limit Control-SPST (On Counterflow Only)
7K—Limit Control-SPDT

Factory Line Voltage
Factory Low Voltage
- - - - - Field Line Voltage

THERMOSTAT CONNECTIONS—HEATING ONLY


W
J
4
G
X
Y
F
4
W
THERMOSTAT P/N 34427D35 (NO-TERMINAL CODE). ALSO MODELS 883-P/N 34427D030 OR 884-P/N 34427D031 THERMOSTAT & SUB BASE.
NOTE: REMOVE INTERNAL JUMPER BETWEEN W & J TERMINALS.
ON-OFF FAN, MODEL 885 P/N 34427D33 THERMOSTAT & SUB-BASE OR THERMOSTAT MODEL 886 P/N 34427D46 WITH SUB-BASE P/N 34427D34.
A68372

SEQUENCE OF OPERATING—HEATING

When the thermostat calls for heat, the control circuit is closed between terminals (4 and W). Power from transformer (1A) energizes automatic gas valve coil (5A) and heating relay coil (2G) simultaneously. After a short time delay, automatic gas valve (5A) opens, permitting gas to flow to the burners where it is ignited by the gas pilot. After another delay, the heating relay switches its contacts (2G), starting blower motor (3A or 3D) on its heating speed.

When the thermostat is satisfied, the circuit between terminals (4 and W) is broken, de-energizing automatic gas valve coil (5A) and heating relay coil (2G). After a few seconds, automatic gas valve (5A) closes, stopping the flow of gas to the main burners. After a longer delay, heating relay (2G) opens its contacts to stop blower motor (3A or 3D).

If the furnace overheats for any reason, limit control (7K) will switch, breaking the circuit to automatic gas valve coil (5A) and making a circuit to heating relay coil (2G). After a short delay, the gas valve closes, shutting off the flow of gas through the main burners. After an additional period of time, heating relay (2G) closes its contacts, energizing blower motor (3A or 3D) (if it is not already operating) on heating speed. It continues to cycle until the fault is corrected.

On counterflow furnaces, additional limit control (7H) protects against overheating also. Should this control sense a high temperature, it opens its contacts, de-energizing automatic gas valve coil (5A) which, in turn, shuts off the flow of gas to the main burners. After limit control (7H) has cooled, its contacts close, automatically energizing automatic gas valve coil (5A). After a short delay, the valve opens, permitting gas to flow to the burners where it is ignited by the pilot. Furnace blower motor (3A or 3D) may or may not be operating, since it is independent of additional limit control (7H).

SEQUENCE OF OPERATION—COOLING

When the thermostat calls for cooling, power from transformer (1A) energizes cooling relay coil (2C), closing its contacts, and energizing blower motor (3A or 3D) on its cooling speed. It continues to operate until the thermostat is satisfied.

When the thermostat is satisfied, the circuit to terminal (G) is broken, de-energizing cooling relay coil (2C) which, in turn, opens its contacts, stopping blower motor (3A or 3D).